

ES2C8-15 Failure Investigation

23/24

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Ishwar Kapoor

Credit value

15

Module duration

10 weeks

Assessment

60% coursework, 40% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

ES2C8-15 Failure Investigation

[Module web page](#)

Module aims

This module will investigate the main failure and degradation mechanisms in a range of materials. It will use a number of laboratory techniques such as materialography Non-Destructive Testing to examine these failures in a range of engineering components.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Failure Mechanisms including;

Fatigue

Fracture

Creep

Corrosion

Design Failure

Investigation methods including;
Optical and Electron Microscopy
Non-Destructive Testing
Mechanical Testing
Social Responsibility
Ethics
Case Studies
Automotive Failures
Crash Investigation
Polymer Product Failures
Composite Material Failures

Learning outcomes

By the end of the module, students should be able to:

- Recognise the main failure mechanisms in a range of engineering materials.
- Link failure mechanisms to variations in materials structure, properties and design in a service context.
- Use a range of laboratory techniques to investigate failures.
- Deduce the failure mechanisms in a range of failed components and present findings
- Understand the importance of social responsibility and ethics in the design of components to avoid failure.

Indicative reading list

Fracture mechanics: integration of mechanics, materials science, and chemistry Wei, Robert Peh-ying. Cambridge University Press. 2010 ISBN 052119489X

Fatigue and fracture: understanding the basics Campbell, F. C. ASM International 2012 ISBN 1615039767

Forensic materials engineering: case studies Lewis, P. R., Reynolds, Ken, Gagg, Colin. CRC Press | c2004. ISBN 0849311829

Forensic engineering investigation Noon, Randall . CRC Press 2001. ISBN 0849309115

To forgive design: understanding failure Petroski, Henry Belknap Press of Harvard University Press 2012. ISBN 9780674065840

Failure analysis case studies: a sourcebook of case studies selected from the pages of Engineering failure analysis Jones, David R. H. Elsevier 1998- 2004. ISBN 0080433383

Case studies in engineering failure analysis, E-Journal, Elsevier Ltd. 2013 ISBN 1118902696

[View reading list on Talis Aspire](#)

Subject specific skills

1. Plan and manage the design process, including cost drivers, evaluating outcomes, and working with technical uncertainty
2. Knowledge and understanding of the need for a high level of professional and ethical conduct in engineering and the use of technical literature and other information

3. Ability to apply relevant practical and laboratory skills
4. Knowledge of professional codes of conduct, how ethical dilemmas can arise, relevant legal and contractual issues.

Transferable skills

1. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
 2. Communicate (written and oral; to technical and non-technical audiences) and work with others
 3. Plan self-learning and improve performance, as the foundation for lifelong learning
 4. Exercise initiative and personal responsibility, including time management, which may be as a team member or leader
 5. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner
 6. Ability to formulate and operate within appropriate codes of conduct, when faced with an ethical issue
 7. Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.
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Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	5 sessions of 2 hours (7%)
Practical classes	3 sessions of 3 hours (6%)
Supervised practical classes	3 sessions of 3 hours (6%)
Other activity	2 hours (1%)
Private study	110 hours (73%)
Total	150 hours

Private study description

110 hrs Guided Independent Learning

Other activity description

1x2 Hours revision (Q&A) class

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time
Group Written Report	60%	
Group project work 2400 words or 15 pages to include Peer assessment		
Exam	40%	
Exam on selected topics linked to the learning outcomes assessed.		

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- Answerbook Pink (12 page)
 - Graph paper
 - Students may use a calculator
 - Engineering Data Book 8th Edition

Feedback on assessment

Formative and summative feedback provided via marksheets for laboratory work.

Cohort level exam feedback provided via examiner's report and model solutions to examination papers

[Past exam papers for ES2C8](#)

Availability

Courses

This module is Option list A for:

- Year 2 of UESA-H335 BEng Automotive Engineering
- Year 2 of UESA-HN15 BEng Engineering Business Management
- Year 2 of UESA-HH75 BEng Manufacturing and Mechanical Engineering
- Year 2 of UESA-HN11 BSc Engineering and Business Studies
- Year 2 of UESA-H336 MEng Automotive Engineering
- Year 2 of UESA-HH76 MEng Manufacturing and Mechanical Engineering